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ABSTRACT

This project was part of the program evaluation of the Iowa Distance Education Alliance, a Star Schools Project funded by the U.S. Department of Education. Thirty Iowa high schools were selected to represent the state. Interviews were conducted with students, faculty, and administration at each of these schools; results were transcribed and analyzed. Individual case studies were written for each site, describing the setting, current level of technology and technology use, perceived impact of technology, and factors contributing to the current state of technology use at that site. Additional analysis was conducted to determine relationships among the variables, including district size, geographical location, reported level of technology use, actual technology use, perceived impact, and critical factors. The primary uses of technology were for word processing, Internet research, and vocational applications. The more technologically advanced schools are incorporating multimedia production into the curriculum as well. This integration of technology is occurring despite multiple barriers, the most significant of which are lack of vision, time, money, access, training, and technology support. The integration of technology in Iowa's classrooms has triggered some important changes. Teachers and students reported changes in teaching methods, increased student-directed learning, increased access to information, and more motivated learning for both students and teachers. (MES)

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TECHNOLOGY, TEACHING, AND LEARNING IN IOWA HIGH SCHOOLS

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Purpose: This project was part of the program evaluation of the Iowa Distance Education Alliance, a Star Schools Project funded by the U.S. Department of Education. The program was at a point where it was necessary to take a step back and examine the overall widespread usage of technology in Iowa's schools to serve as baseline for future activities and to support informed decision making.

Design: Descriptive and qualitative.

Population: Thirty Iowa high schools were selected to represent the state. Interviews were conducted with students, faculty, and administration at each of these schools.

Methods: Results from interviews with students, faculty, and administrators were transcribed and analyzed. Individual case studies have been written for each site describing the setting, current level of technology and technology use, perceived impact of technology, and factors contributing to the current state of technology use at that site. Additional analysis was conducted to determine relationships among the various variables including district size, geographical location, reported level of technology use, actual technology use, perceived impact, and critical factors.

Findings: The primary uses of technology are for word processing, Internet research, and vocational applications. The more technologically advanced schools are incorporating multimedia production into the curriculum as well. This integration of technology into the curriculum is occurring despite multiple barriers, the most significant of which are lack of vision, time, money, access, training, and technology support. The integration of technology in Iowa's classrooms has triggered some important changes. Teachers and students report changes in teaching methods, increased student-directed learning, increased access to information, as well as more motivated learning for both students and teachers.

Purpose

This multi-site case study was conducted as part of the program evaluation of Iowa's Star Schools Project, Iowa Distance Education Alliance. Thirty high school sites were selected to represent the state of Iowa based on:

1. district enrollment,
2. rural or urban setting,
3. technology use, and
4. geographical location.

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Data collection incorporated document review, site-visit observations, one-on-one interviews, and focus group interviews. In addition, survey data collected by the Iowa Department of Education provided demographic and technology data for each site selected. This study provided both qualitative and quantitative baseline data about the status of technology use in education in Iowa. Research questions included:

1. How is technology making a difference in the learning process for Iowa high school students?
2. How does technology change what and how teachers teach?

In general, what is the current state of technology and technology use in Iowa high schools?

Rationale

Statewide research on technology integration in Iowa schools has focused on quantitative data. Specifically, the Iowa Department of Education technology survey has requested information on the number of computers in the school, the number of students per computer, the number of schools with access to the Internet and other numerical data. This baseline data was intended to "describe the status of Iowa public school technology, to reflect needs, and to facilitate the school improvement process" (IDOE, 1997).

While statistics are helpful, they don't seem to hold up to closer scrutiny. How schools interpreted the questions varied widely among districts. In computing the number of students per computer, many districts included computers that are dedicated to administrative uses and inaccessible to students. In addition, older model computers (only capable of word processing) were counted the same as more powerful computers capable of full multimedia computing. Schools reported Internet access even if the only access they had was one line in the administrator's office or the media center.

Technology integration is more than installing hardware and software. In order to understand the process of change involved with technology integration it is imperative to speak with the people involved. The baseline study focused on the people involved in integrating technology in the schools rather than counting hardware and software. To better understand the change process as it relates to technology integration, it is important to know what motivates districts to integrate technology into the curriculum, how problems are addressed, and how technology is changing teaching and learning. This information will assist policy makers to determine where additional support is needed as the technological landscape in our schools continues to change.

Relevant Literature Review

Despite the potential many believed technology had for revolutionizing education, education has changed little in the past decades (David, 1994). While access to technology in schools continues to increase, the overall change in teaching and learning has been minimal (Zappone, 1991). The International Society for Technology in Education (ISTE) identified the need for teachers to model computer use in the classroom and to naturally integrate technology in the curriculum in relevant ways that prepare students to face the challenges of the next century (Friske, et. al., 1995). However, few schools are succeeding in helping teachers and students actually infuse computers into their daily lives. (OTA, 1995).

Change theory provided a framework for examining the process that occurs when districts attempt to integrate technology into the curriculum. Because of its focus on the individuals involved in the change process, Hall's Concerns Based Adoption Model (CBAM) was particularly useful (Hall, 1974b). CBAM provided a structure for examining the very complex process that occurs when educational institutions become involved in adopting innovations.

CBAM views the teacher as the focal point in school improvement efforts, yet acknowledges significant social and organizational influences as well. The model focuses on two facets of the individual's developmental growth in relation to the innovation. These components provide a reference for interpreting an individual's level of concern and level of use in relationship to technology integration.

Sample

In order to capture the true reality of technology in Iowa's high schools, 30 schools were selected to represent the state. In addition to requiring two schools from each of the 15 Regions in the state, we used three selection criteria: population density, enrollment and current technology level.

The two charts shown below compare the schools we visited to all public school districts based on population density and enrollment. We tried to reflect the state on these statistics. Population density (Chart 1) ranged from 10.5 individuals per square mile to a high of 2388.5 people per square mile. The number of students (Chart 2) in the district ranged from a low of 202 to a high of 32,033.

The results of the State Department of Education Technology survey were used to determine current levels of technology. Across the state the average number of students per computers was about six. The 15 high technology schools visited had fewer than four students per computer. In contrast, the 15 low technology schools reported an

average of over 14 students per computer. All schools said they had Internet access and sixty percent were connected to the Iowa Communications Network.

Chart 1: Comparison of Statewide Districts and Visited Districts by Population Density

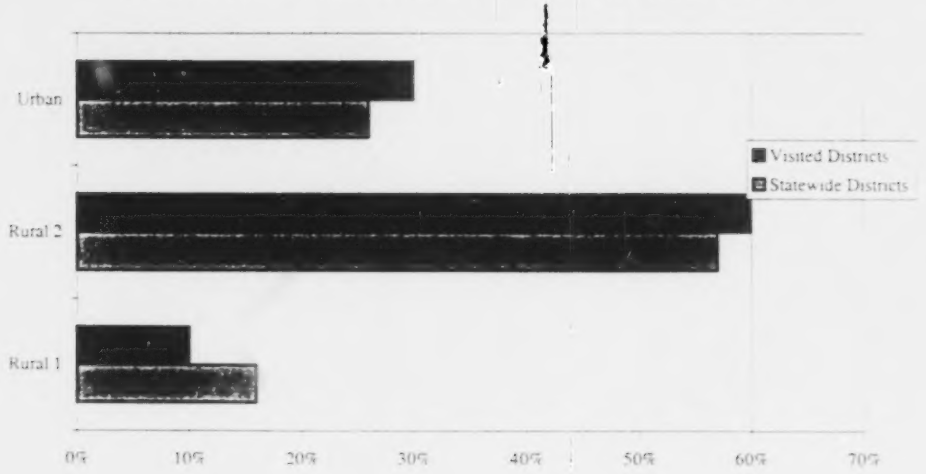
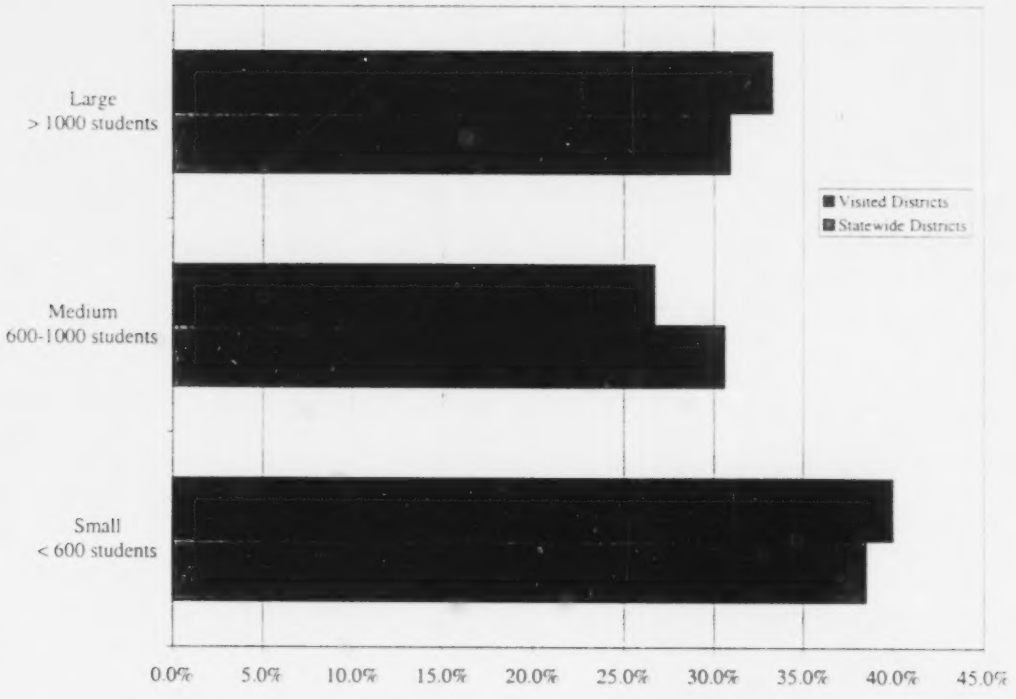


Chart 2: Comparison of Statewide districts and Visited Schools by District Enrollment



We covered every corner and region of the state in our desire to understand technology integration in Iowa. We traveled to schools in small town Iowa, consolidated schools located in the middle of farmland, and major urban area schools. The level of technology we found was as diverse as the settings. Frequently, our assumptions about

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where we thought we would find high levels of technology integration proved to be wrong. Some seemingly isolated schools were surprisingly technology rich. We visited schools where technology was not recognized as a high priority. We also visited schools where both teachers and administrators have identified the need for technology integration and actively planned for effective integration of technology into the school curriculum. And, as was to be expected, we found many schools in varying degrees between the two extremes.

Limitations of the Study

Three delimiting factors of the study were identified: technology level, teacher/student selection, and researcher biases. Technology level was used as a site selection criteria. However, pupil to computer ratios varied considerably around the state, between AEAs, and within each AEA. The selection of a high and low technology school within each AEA provided more of a continuum representing a range of technology levels instead of a statewide representation of extremes.

Researchers had little or no control over the selection of students and teachers for the focus group sessions. While a random group was requested, at some sites it appeared that teachers particularly had been selected for their technology expertise. It is suspected that our sample of teachers may be slightly skewed as a result of this. Student selection appeared to be more random.

The third delimiting factor resulted from the number of researchers required for the data collection phase of this study. While all researchers were trained and provided with guidelines and questions, natural biases in the way the questions were asked and the prompts used may have affected the responses of individuals participating in the focus groups and one-on-one interviews.

Data Collection

Because of the political interest in this study, a large number of sites were selected to allow generalizability. Thirty high schools were selected to represent a cross-section of the state. All Area Education Agencies (AEAs) were represented. In addition, sites were selected to reflect state statistics on enrollment, population density, and technology.

A site visit was arranged with each site to include one-on-one interviews with the principal and the technology coordinator, focus group interviews with a group of teachers and with a group of students, and a tour of the facility. All research teams were trained and provided with interview guides and observation checklists. One researcher was responsible for recording all interviews but to insure accuracy all interviews were taped except in rare instances where permission was denied.

Data collection began during the third week of March 1998, and continued through the middle of May. Each of the thirty selected high schools was visited for the majority of a school day by two researchers. The typical visit began with a one-hour interview with the high school principal, followed by a tour of the school. The tour was usually led by the technology coordinator, a teacher highly involved in technology at the school, or the principal. The researchers usually spent the lunch hour in the faculty dining area, discussing technology casually with teachers. The focus group with students was often held right after lunch, typically with a random group of students who were assigned to study hall for that period. The teacher focus group was typically held right after school.

The data gathered at each school was used to write a case study for each site visited. Primarily the lead researcher for each site wrote these case studies, but the assistant researcher reviewed the case study draft and provided input and clarification. This member checking process allowed for review, verification and comment. Conclusions were revised and clarified based on recommendations from the member-checking process.

Next, the text of the focus group sessions and principal interviews was formatted for use with a computer software program for qualitative research. The Non-numerical Unstructured Data Indexing Searching and Theorizing (NUD*IST) software allows for efficient management of the large amount of data collected for the project, detailed exploration of the data, and makes it easier to see patterns in the data.

Two researchers coded the text of the focus group sessions and interviews. Each researcher coded data into a core group of agreed upon categories, and each researcher was allowed to create new categories as needed. After all documents had been coded, the researchers discussed and justified additions. Some coding categories were combined at this point.

When the coding phase of the research was completed, researchers checked inter-coder reliability to look for potential coding problems. Four key categories with subcategories were chosen to test reliability. There was complete agreement (100%) in three of the four categories. The category called "vision" had a very low reliability – 25%. The original four subcategories were not discrete, and therefore it was difficult to place some text units in only one category. The four subcategories were then collapsed into two categories, making them discrete.

The focus group data was then triangulated with other data collected at the site: the principal interview, the focus group discussion with students at the school, the technology coordinator interview, observational data, and the district technology plan. Triangulation helped to pinpoint the accuracy of conclusions through the use of several

sources of data. It also helped prevent the researcher from accepting the validity of his or her initial impressions without further substantiation and served to control for researcher biases.

Results

Analysis of data indicated a great diversity of technology integration in Iowa's high schools. Original thoughts about a relationship between size of district and level of technology do not appear to be supported by the data. In addition, data seems to conflict with previous conceptions related to the level of technology in rural districts. Data also seems to be providing a clearer picture of technology than was available with previous quantitative data.

A look at the current state of technology in Iowa High Schools indicated four most common uses of technology by both teachers and students. This included word processing, Internet, vocational applications, and multimedia uses. The vast majority (over 80%) of the teachers and students in our sample reported having a computer at home and approximately 50% indicated they had Internet access at home.

When teachers were asked to define integration of technology, the majority identified technology as a tool. Many indicated that integrating technology allowed them to vary the instructional approach and to provide educational experiences that would be difficult to do otherwise. Many saw technology integration as the way to connect schoolwork to the "real" world.

There was a difference in response between teachers at high technology schools and teachers at low technology schools. Teachers at low technology schools seemed to focus on why they couldn't integrate technology. The lack of access seemed to cloud their vision of what might be possible.

Teachers identified several factors that motivated them to integrate technology. One major factor was increased enthusiasm for learning. Teachers indicated their enthusiasm increased in addition to their students' enthusiasm for learning when technology was used as part of the curriculum. This encouraged both teachers and students to get excited about the content area in new ways. Teachers also indicated that they used technology because it helped them to prepare students for the future. They saw student preparation for entering either the workforce or college as a primary motivating factor for using technology. Other motivating factors included administrative support or directive, and the influence of colleagues.

Again, there appeared to be a difference between high and low technology schools. Teachers at low technology schools tended to avoid identify motivating factors and instead point out why they couldn't use technology.

It became evident that there were several barriers to technology integration. Barriers included inadequate training, inadequate access, lack of time, and lack of a common vision for technology integration. Of these, vision seemed to be the most critical.

Where technology was being successfully integrated, there was a vision holder who could clearly identify expectations of technology use. In some schools the vision holder was an administrator, either the superintendent or principal, in others it was a group of teachers.

> What we want to do is make the technology so that when you come into a classroom you don't come out thinking "what a wonderful technology we have in the classroom", you come out thinking about the wonderful student learning that is going on. Whether it is a microscope, scanner, or computer, we want that technology to assist all our students so that they can learn. It's a big shift in the way our teachers will be presenting information....There are still a lot of good things happening in terms of hands on learning, but we want technology to come in where it's very pertinent and very relevant.
>
> Principal

Where technology was being integrated, teachers reported several changes occurring. First of all was the role of the teacher. Classrooms become more student centered and the teachers become facilitators of learning. Use of lecture is down and students are given more responsibility for their own learning.

Not only did the role of the teacher change but the role of the student also changed. Students were more motivated. They were going out and getting information rather than waiting for a teacher to provide the information. Technology also allowed teachers to individualize lessons and meet the needs of a variety of students.

Other important changes identified by teachers included additional information sources, increased efficiency and increased teacher collaboration/cooperation.

In summary, we found that the majority of teachers view technology as a tool. They are motivated to use technology because of their own desire to learn and grow professionally and by their desire to provide this same opportunity for their students. While there are many barriers to successful integration of technology, schools with a vision are overcoming these barriers and seeing important changes occurring in the classroom.

Significance

Two aspects of this study make significant contributions to the field of program evaluation and technology integration. The methodology used in this study serves as a model for others conducting needs assessments or impact

studies related to program evaluation. In addition, the results of this study provided insight into the change process related to technology integration. It allows stakeholders to make informed decisions and allocate funds and programs so technology can make the most impact on teaching and learning and overall school improvement.

Recommendations made to stake holders identified three areas that need to be addressed to assist schools in making a successful transition to full integration of technology. These areas included training, access, and technology vision/planning.

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